

REMARKS

This continuing prosecution application is filed to obtain amendment of the claims or in the alternative, to place the application in better form for appeal. The Examiner declined to enter the amendments presented by amendment mailed April 29, 2003 stating that the amendment presented new issues since new limitations added to the claims were not present in the finally rejected claims. It is noted that the addition of limitations to pending claims is, by definition, the addition of limitations not already present. The voluntary addition of limitations to claims represents a good faith approach to placing the application in condition for allowance.

By Office action mailed 3 February 03, The Examiner had maintained a previous rejection based upon Mansfield. et al, of record. Applicant is obliged to point out that the rejection of claim 1 as expressed in Examiner's paragraph 2 of paper #5 is in error because the reference does not support the Examiner's interpretation of the reference, or simply reflects a misunderstanding of the present claim. The Examiner stated (erroneously) that

“Mansfield discloses.....a pair of shield coils, disposed coaxially around said gradient coils, *each of said shield coils being of radius b* which is greater than a (Column 17, lines 30-34; Figure 25, #S1 and #S2),...” (emphasis added).

It is not the case that S1 and S2 of the reference are of the *same* radius and these shields are not representative of the pair of axially spaced, equal radius shields of the present invention. Moreover, the proffered amending language for the instant invention,

“.... said shield coils of equal radius and axially spaced....”

is supported by figure 1 where coils 15 and 16 are clearly axially displaced. The shield coils are said to “each enclose a corresponding one of the primary coils 11 and 12” and therefore are axially displaced because the primary (gradient) coils are so described (p. 2, lines 29-31, for example, and p.2, line 32-p.3, line 3. The axially displaced shield coils share a common radius, as can be observed by the specification at p.2, line penultimate line where “the radius of the secondary coils 15 and 16 is denoted by letter $b > a$ ”. Now consider that the radius b explicitly appears as a parameter of the expressions governing the operation of the invention, (Eqs 2, 2', 4). There is only one radius “ b ” shared by both axially displaced shield coils 15 and 16. The radius b is a parameter of the design. p.6, line 7-10.

The further limitation refers to causing currents of equal magnitude “and opposite sense”

and “selected axial dependence” to flow through said shield coils. These limitations may be found in the specification at p. 3, line 4- 7; p.5, line 14 - 16; p.2, line 5-6 and line 19-21; p. 5, lines 9- 13; p. 6, lines 1-6.

Applicant again offers amendment designed to more clearly distinguish the invention over the shields of Mansfield. Applicant’s shield coils answer a practical requirement for frugal use of space within the bore of an NMR magnet, whereas the Mansfield shields contribute additional dead space to serve the need of his *radially* spaced shield coils. The present invention provides active shielding without imposing such dead space. The waste of space inside of the bore of an NMR magnet is a major concern. This volume is severely limited because of the need to achieve a uniform magnetic field therein (apart from the separate imposition of a controlled gradient). The further limitation of the Mansfield reference reduces the radial dimension of any object presented for study and limits the use of other accessories. Consequently, the present invention represents a major improvement in filling factor.

At col.17, line 25, Mansfield remarks that a Maxwell pair is known for producing a z gradient field. (The present invention is not simply a Maxwell pair). However, in introducing figure 25, at col. 17, lines 30, et sequi, the discussion by the reference is in terms of a simple saddle coil for producing a transverse gradient. The contribution of Mansfield is not the simple gradient coil arrangement, but the active shielding achieved with his two active coaxial cylindrical screens of radii b and c greater than gradient coil radius a. The present invention achieves the desired active screening in a shield assembly at a single radius.

The Examiner has frequently referenced figures 19 and 25 of Mansfield, et al. It is evident that the saddle coils shown and discussed at col. 12 are not a Maxwell pair. Moreover, the geometry of the quoted Mansfield reference is not to be compared with the present invention, inasmuch as the invention provides in claim 1 for “a magnetic field along said z-axis with a linear gradient near said origin in said z direction”. Figures 19 and 25 of Mansfield are examples for which

“ a gradient field is produced in the form of a magnetic field along the z axis which has a gradient in the x direction.” (emphasis added).

Thus the Examiner is comparing a Mansfield transverse saddle coil for producing $\partial B_z / \partial x$ (a transverse gradient) with the present extended Maxwell pair for producing $\partial B_z / \partial z$ (an axial

gradient).

The Examiner has also combined Vavreck, of record with Mansfield as basis for rejection of dependent claim 5. The combination suffers from the distinction that Vavreck describes a Maxwell pair for z axis gradients whereas Mansfield is limited to two nested radially displaced shields.

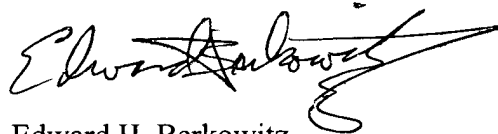
It is sufficient to remark that claim 5 should be allowable for the reason of its dependence upon an allowable claim.

Claim 11 contains the constraint that for the pair of shield coils disposed axially spaced and coaxially

“each of said shield coil surfaces being of radius b...”.
is a clear limitation of identical radii for the shield coils and is necessary to describe the geometry to which the case applies. The radially spaced shields of Maxwell is distinguished.

Applicant has taken care to so amend claim 1 as to remove any ambiguity and clearly distinguish over prior art. The degree to which such prior art does not apply has been pointed out and it is believed that the claims are in condition for allowance. Such action is respectfully requested.

Respectfully submitted,



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